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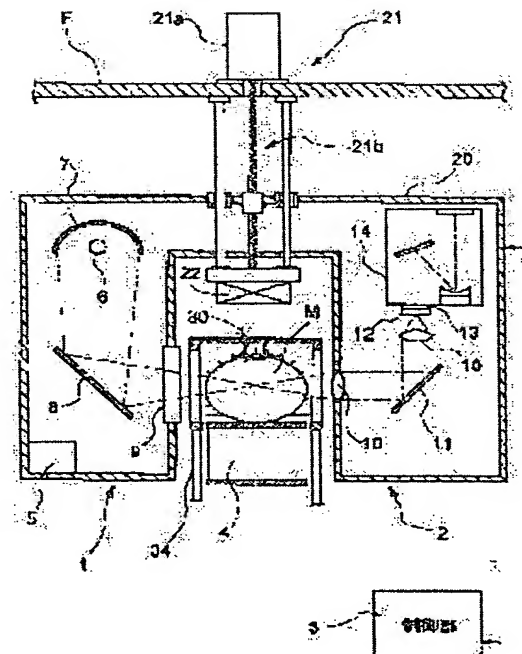
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(54) SPECTROSCOPIC ANALYZER

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a spectroscopic analyzer, capable of performing accurate measurements by suppressing the occurrence of measurement errors due to wraparound light.

SOLUTION: The spectroscopic analyzer is provided with a transfer means 4 for transferring an object to be measured M via a measuring location. A light-projecting means 1 for projecting light toward the object to be measured M located at the measuring location and a light-receiving means 2 for receiving light projected from the light-projecting means 1 and transmitted through the object to be measured M are divided and arranged at locations, on both the right and left sides of the measuring location. The spectroscopic analyzer is provided with an arithmetic processing part 3 for obtaining the internal quality information of the object to be measured M, on the basis of the result of the measurement of the light-receiving means 2 and a light-shielding means 30 at the measuring location for shielding wraparound light, which is about to be set incident on the light-receiving means 2 without



transmitting through the object to be measured M among the light projected from the light-projecting means 1, while allowing the passage of the object to be measured M.

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CLAIMS

[Claim(s)]

[Claim 1] A floodlighting means to project light to said measured object which a conveyance means to convey a measured object via a measurement part is established, and is located in said measurement part, A light-receiving means to receive the light which was projected from the floodlighting means and penetrated said measured object It is spectral-analysis equipment constituted by having the data-processing section which distributes to the right-and-left both-sides part of said measurement part, is arranged, and asks for the internal quality information of a measured object based on the measurement result of said light-receiving means. Spectral-analysis equipment with which said measurement part is equipped with a protection-from-light means to intercept the surroundings lump light which is going to carry out incidence to said light-receiving means, without penetrating said measured object among the light projected from said floodlighting means while it permits that said measured object passes.

[Claim 2] Said conveyance means is constituted so that installation conveyance of said measured object may be carried out. Said protection-from-light means Set in the conveyance direction superior side part list rather than the optical projection location by said floodlighting means of said measured object located in said measurement part, and it sets to each of an upper part side part rather than the conveyance direction lower part side part and said optical projection location. The screen which is equipped with the screen which intercepts said surroundings lump light, is constituted, and is located in each of the said conveyance direction superior side part, the conveyance direction lower part side part, and an upper part side part is spectral-analysis equipment according to claim 1 constituted free [evacuation] so that passage of said measured object may be permitted.

[Claim 3] The screen located in the said conveyance direction superior side part and each conveyance direction lower part side part While having opening which permits passage of said measured object, in the opening edge in each opening It is spectral-analysis equipment according to claim 2 which two or more tongue-shaped pieces cut and lacked in the list and the longitudinal direction are formed in the vertical direction, and is constituted free [evacuation] so that each tongue-shaped piece may permit passage of said measured object in each **, respectively.

[Claim 4] While each of the optical-path formation member for light-receiving which forms the optical path for light-receiving for leading the optical-path formation member for projection which forms the optical path for projection which projects light on a measured object, and the light which penetrated the measured object to said light-receiving means is constituted from said floodlighting means by tubed The floodlighting side electric shielding member in which the optical passage hole which the point by the side of the measured object of said optical-path formation member for projection is equipped with said protection-from-light means, and stands in a row in said optical path for projection was formed, Prepare for the point by the side of the measured object of said optical-path formation member for light-receiving, have the light-receiving side electric shielding member in which the optical passage hole which stands in a row in said optical path for light-receiving was formed, and it is constituted. Spectral-analysis equipment according to claim 1 constituted so that said floodlighting side electric shielding member and a light-receiving side electric shielding member may be formed in the shape of [which

projects in said measurement part side] a truncated cone and forcible rotation actuation may be carried out in the same direction by the circumference of the axis of abscissa centering on said each optical passage hole.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the spectral-analysis equipment used in order to analyze the internal quality of measured objects, such as garden stuff. In detail A floodlighting means to project light to said measured object which a conveyance means to convey a measured object via a measurement part is established, and is located in said measurement part, It is projected from a floodlighting means, and a light-receiving means to receive the light which penetrated said measured object distributes to the right-and-left both-sides part of said measurement part, and is arranged, and it is related with the spectral-analysis equipment constituted by having the data-processing section which asks for the internal quality information of a measured object based on the measurement result of said light-receiving means.

[0002]

[Description of the Prior Art] In the spectral-analysis equipment of the above-mentioned configuration in the former A floodlighting means to project light to the measured object which is conveyed with a conveyance means and located in a measurement part as shown in JP,7-229840,A For example, the light source of a halogen lamp etc., As the light generated from the light source was reflected in the concave surface reflective section of an ellipse form and it was made to condense so that it may converge in a measurement part, it was constituted so that a measured object might be irradiated and the transmitted light from the measured object could be measured with a light-receiving means. It is made to make the light generated from the light source so that it may not be detected accidentally [carry out / the surroundings / which turn around even to a light-receiving means side indirectly / lump light which the light on which such a configuration is projected from a floodlighting means diffuses, and it is reflected by turning even to a direct and light-receiving means side **** or other objects through the periphery section of a measured object, and are carried out / incidence to a light-receiving means and] condense.

[0003]

[Problem(s) to be Solved by the Invention] However, in this kind of spectral-analysis equipment, only the very small quantity of light of the quantity of lights on which the permeability of light of the garden stuff which is a measured object etc. is very small, and it is projected from a floodlighting means will be received with a light-receiving means. Therefore, in order to receive the quantity of light which is needed in order to ask for the internal quality information of a measured object, it is necessary to enlarge floodlighting reinforcement by the floodlighting means. When floodlighting reinforcement of a floodlighting means was enlarged such, it was not that to which a possibility that a strong light on which it is projected from a floodlighting means in a configuration may turn even to a light-receiving means through the periphery section of a measured object can fully control a large next door and such a surroundings lump light conventionally [above-mentioned]. Consequently, since the light-receiving means received surroundings lump light which was described above, there is a possibility that that part and measurement precision may fall, and an improvement was desired at this point.

[0004] This invention is made paying attention to this point, and the purpose controls generating of the

measurement error by surroundings lump light which was described above, and is in the point of offering the spectral-analysis equipment which becomes possible [measuring with a sufficient precision].

[0005]

[Means for Solving the Problem] A floodlighting means to project light to said measured object which according to claim 1 a conveyance means to convey a measured object via a measurement part is established, and is located in said measurement part, A light-receiving means to receive the light which was projected from the floodlighting means and penetrated said measured object In the spectral-analysis equipment constituted by having the data-processing section which distributes to the right-and-left both-sides part of said measurement part, is arranged, and asks for the internal quality information of a measured object based on the measurement result of said light-receiving means It is characterized by equipping said measurement part with a protection-from-light means to intercept the surroundings lump light which is going to carry out incidence to said light-receiving means, without penetrating said measured object among the light projected from said floodlighting means, permitting that said measured object passes.

[0006] Therefore, since the surroundings lump light which is going to carry out incidence to a light-receiving means is intercepted effectively, without penetrating a measured object among the light projected from the floodlighting means by equipping a measurement part with a protection-from-light means, a possibility that it may be incorrect-detected by the light-receiving means becomes few things. And there are few possibilities of reducing working capacity, without the measured object by which this protection-from-light means is conveyed via a measurement part by the conveyance means having composition which intercepts surroundings lump light effectively while it permits passing through a measurement part, and checking conveyance by the conveyance means.

[0007] Consequently, generating of the measurement error by surroundings lump light which was described above is controlled in the disadvantageous condition of reducing working capacity of not being generated, and it was able to come to offer the spectral-analysis equipment which becomes possible [measuring with a sufficient precision].

[0008] According to claim 2, it sets to claim 1. Said conveyance means It is constituted so that installation conveyance of said measured object may be carried out. Said protection-from-light means Set in the conveyance direction superior side part list rather than the optical projection location by said floodlighting means of said measured object located in said measurement part, and it sets to each of an upper part side part rather than the conveyance direction lower part side part and said optical projection location. The screen which is equipped with the screen which intercepts said surroundings lump light, is constituted, and is located in each of the said conveyance direction superior side part, the conveyance direction lower part side part, and an upper part side part is characterized by being constituted free [evacuation] so that passage of said measured object may be permitted.

[0009] Namely, the measured object which installation conveyance of the protection-from-light means is carried out with a conveyance means, and is located in a measurement part is received. Rather than the optical projection location by the floodlighting means of the measured object, in the conveyance direction superior side part list The conveyance direction lower part side part, and it being projected on the light of big floodlighting reinforcement from a floodlighting means, and, even if the light which turns around the periphery section of a measured object occurs since it has the screen which an upper part side part is alike, respectively, sets, and intercepts surroundings lump light and consists of optical projection locations Rather than the conveyance direction superior side part, the conveyance direction lower part side part, and an optical projection location, since surroundings lump light is certainly intercepted in each of an upper part side part by said each screen, by it, a possibility of carrying out incidence to a light-receiving means accidentally becomes few things from an optical projection location.

[0010] And since it is constituted free [evacuation] so that passage of said measured object may be permitted, while the measured object conveyed via a measurement part by the conveyance means permits passing through a measurement part, said screen From an optical projection location, rather than

the conveyance direction superior side part, the conveyance direction lower part side part, and an optical projection location, said surroundings lump light can be intercepted in each of an upper part side part, and a suitable means to carry out claim 1 is acquired.

[0011] According to claim 3, in claim 2, the screen located in the said conveyance direction superior side part and each conveyance direction lower part side part While having opening which permits passage of said measured object, two or more tongue-shaped pieces cut and lacked in the list and the longitudinal direction in the vertical direction are formed in the opening edge in each opening, and it is characterized by constituting each tongue-shaped piece free [evacuation], respectively so that passage of said measured object may be permitted in each **.

[0012] namely, said each screen is equipped with opening which permits passage of a measured object, and in the opening edge in each opening Since two or more tongue-shaped pieces are formed in the vertical direction, and each tongue-shaped piece is constituted free [evacuation], respectively so that passage of said measured object may be permitted in each ** and it permits passage to the measured object which passes through a measurement part while said each tongue-shaped piece evacuates to each ** For example, making the curved appearance configuration meet and maintaining an optical cut off state, even if an appearance is a measured globular form or almost globular form object like garden stuff, it becomes what can permit passage and a suitable means to carry out claim 2 is acquired.

[0013] The optical-path member for projection which forms the optical path for projection which projects light on a measured object from said floodlighting means according to claim 4, While each of the optical-path formation member for light-receiving which forms the optical path for light-receiving for leading the light which penetrated the measured object to said light-receiving means is constituted by tubed, and said protection-from-light means The floodlighting side electric shielding member in which the optical passage hole with which the point by the side of the measured object of said optical-path formation member for projection is equipped, and which stands in a row in said optical path for projection was formed, Prepare for the point by the side of the measured object of said optical-path formation member for light-receiving, have the light-receiving side electric shielding member in which the optical passage hole which stands in a row in said optical path for light-receiving was formed, and it is constituted. Said floodlighting side electric shielding member and a light-receiving side electric shielding member are characterized by being constituted so that it may be formed in the shape of [which projects in said measurement part side] a truncated cone and forcible rotation actuation may be carried out in the same direction by the circumference of the axis of abscissa centering on said each optical passage hole.

[0014] That is, the light on which it is projected from a floodlighting means lets the optical path for projection of the optical-path member for projection, and the optical passage hole formed in the floodlighting side electric shielding member pass, and is irradiated by the measured object. And the light which penetrated the measured object is led to a light-receiving means through the optical passage hole formed in the light-receiving side electric shielding member, and the optical path for light-receiving of the optical-path formation member for light-receiving. And a floodlighting side electric shielding member and a light-receiving side electric shielding member are formed in the shape of [which projects in a measurement part side] a truncated cone. Since it is constituted so that forcible rotation actuation may be carried out in the same direction by the circumference of the axis of abscissa centering on each optical passage hole, and the measured object which was conveyed with the conveyance means and arrived at the measurement part It can change into the condition of projecting light where the side face by the side of the measurement part of the floodlighting side electric shielding member formed in the shape of a truncated cone and a light-receiving side electric shielding member showed around and said each optical passage hole is approached. And said each covered member becomes possible [carrying out passage migration smoothly], without checking conveyance, even if it is the case where a measured object contacts each covered member since forcible rotation is carried out in the same direction.

[0015] Therefore, without working capacity making it fall, without checking the conveyance migration by the conveyance means, as a measured object is passed in the condition of bringing close, as much as possible between a floodlighting side electric shielding member and a light-receiving side electric

shielding member, it becomes possible to intercept said surroundings lump light, and a suitable means to carry out claim 1 is acquired.

[0016]

[Embodiment of the Invention] Hereafter, about the spectral-analysis equipment concerning this invention, it prepares for the fruit-sorting facility which performs sorting classification of a mandarin orange as a measured object, and the case where it applies to the configuration which measures the internal quality information of a mandarin orange, i.e., a sugar content, acidity, etc., is explained based on a drawing.

[0017] The floodlighting section 1 as a floodlighting means by which this spectral-analysis equipment irradiates light at the measured object M (mandarin orange) as shown in drawing 1, the light which penetrated the measured object M -- a spectrum -- carrying out -- the light which carried out the spectrum -- receiving light -- a spectrum, while controlling actuation of the light sensing portion 2 as a light-receiving means to obtain spectrum data, and each part It has the control-section 3 grade which functions as the data-processing section which asks for the internal quality information of a measured object based on the measurement result of a light sensing portion 2, and is constituted. The measured object M (mandarin orange) It has become column-like by the single tier by conveyance conveyor 4 with the configuration by which installation conveyance is carried out, and it is constituted so that it may pass through the measurement part by this spectral-analysis equipment one by one. And after the light projected from the floodlighting section 1 penetrates the measured object M to the measured object M located in a measurement part, in the condition that light is received by the light sensing portion 2, the floodlighting section 1 and a light sensing portion 2 distribute to the right-and-left both-sides part of a measurement part, and are arranged.

[0018] The reflecting mirror 8 sideways changed towards the measured object M which said floodlighting section 1 reflects the reflected light by that reflecting plate 7 while having the halogen lamp 6 as an emitter which emits light with the power supplied from a power circuit 5, and the reflecting plate 7 of the concave surface configuration reflected towards a lower part side so that the light which emits light from this halogen lamp 6 may be made to condense, and is located in a measurement part is formed. Furthermore, the shutter device 9 which can be freely switched to the condition that the light reflected with the reflecting mirror 8 is irradiated by the measurement part, and the condition of intercepting light is established.

[0019] In said light sensing portion 2 The condenser lens 10 which condenses the light which penetrated the measured object M, the reflecting mirror 11 which reflects light upward, the color filter 12 which passes only the light of a wavelength field for measurement which is mentioned later, and the shutter device 13 which can be freely switched to the open condition of passing light, and the closed state which intercepts light, if incidence of the light which passed the shutter device 13 of an open condition is carried out -- the light -- a spectrum -- carrying out -- said spectrum -- it has the spectroscope 14 grade which measures spectrum data, and is constituted. The reflecting mirror 16 which reflects the light which carried out incidence from ON **** 15 as said spectroscope 14 is shown in drawing 2, the spectrum which carries out the spectrum of the reflected light to the light of two or more wavelength -- with the concave grating 17 as a means detecting the optical reinforcement for every wavelength in which the spectrum was carried out by the concave grating 17 -- a spectrum -- the photo sensor 18 which measures spectrum data has composition arranged in the black box 19 which consists of a protection-from-light nature ingredient which shades the light from the outside. Said photo sensor 18 consists of 1024-bit MOS mold line sensors which change and output the transmitted light by which the part light reflex was carried out by the concave grating 17 to the signal for every wavelength while receiving light for every wavelength to coincidence. Although a detailed explanation is not carried out, this line sensor carries out the interior of the drive circuit for making the capacitor which accumulates the charge obtained in optoelectric transducers, such as a photodiode, and the optoelectric transducer of those for every unit pixel, and its stored charge output outside etc., and is constituted. In addition, the charge storage time by the capacitor can be made to change through a drive circuit from the exterior now. And the light of the wavelength of the range of 700nm - 1100nm can be detected now.

[0020] Said floodlighting section 1 and light sensing portion 2 can be prepared in the condition of being supported in one with the frame 20 prepared so that the upper part side of the measurement part through which the measured object M passes might be bypassed, and, as for this frame 20, that whole can carry out now modification accommodation of the location of the vertical direction to the conveyance conveyor 4 by the vertical regulatory mechanism 21. Although a detailed explanation is not carried out about the vertical regulatory mechanism 21, it can be made to move up and down by screw delivery device 21b which it is installed in the state of location immobilization to a fixed part F, and is driven in electric motor 21a. And you make it located in the upper part side of the passage part of the measured object M in said conveyance conveyor 4, and the reference filter 22 which is an example of a criteria object is formed in the condition that location immobilization is carried out, by said fixed part F. This reference filter 22 consists of light filters which have a predetermined absorbance property, and, specifically, is constituted using opal glass.

[0021] And by carrying out centering control of said whole frame 20 in the vertical direction As it is indicated in drawing 3 (b) as the usual measurement condition received by the light sensing portion 2 after the light from the floodlighting section 1 penetrates the measured object M laid in the conveyance conveyor 4, as shown in drawing 3 (b) After the light from each floodlighting section 1 penetrates said reference filter 22, it is constituted so that it can switch to the reference measurement condition received by the light sensing portion 2.

[0022] Said conveyance conveyor 4 has the composition of driving endless rotation band 4a by electric motor 4b. It has the rotary encoder 23 which detects the rotation condition of the revolving shaft of body-of-revolution 4c which winds the endless rotation band 4a. The detection information on this rotary encoder 23 also has the composition of being inputted into a control section 3, and further, as shown in drawing 5, the conveyance direction superior side part of said measurement part by the conveyance conveyor 4 is equipped with the optical passage sensor 24 which detects passage of the measured object M. Photogenic organ 24a which emits light, and electric-eye 24b which receives that light this passage sensor 24 it distributes to the right-and-left both-sides section of the conveyance path by the conveyance conveyor 4, and is arranged, if the light which the measured object M did not exist but emitted light from photogenic organ 24a is received in electric-eye 24b, it will be in an OFF state, and light is interrupted by the measured object M, and light receives light in electric-eye 24b -- it has -- it can kick and will be in an ON state.

[0023] And in this spectral-analysis equipment, it has the protection-from-light member 30 as a protection-from-light means to intercept the surroundings lump light which is going to carry out incidence to a light sensing portion 2, without penetrating the measured object M among the light projected from the floodlighting section 1, permitting that said measured object M passes in said measurement part. If it explains in full detail, will set this protection-from-light member 30 in the conveyance direction superior side part list from the optical projection location Q by the floodlighting section 1 of the measured object M located in a measurement part, and it will be set to each of an upper part side part from the conveyance direction lower part side part and the optical projection location Q. Have the screens 31a, 31b, and 31c which intercept surroundings lump light, and it is constituted. The screens 31a, 31b, and 31c located in each of the conveyance direction superior side part, the conveyance direction lower part side part, and an upper part side part It is constituted free [evacuation] so that passage of the measured object M may be permitted. Further The screens 31a and 31b located in the conveyance direction superior side part and each conveyance direction lower part side part While the openings K1 and K2 which permit passage of the measured object M are formed, in the opening edge in each opening K1 and K2 Two or more tongue-shaped pieces Z cut and lacked in the list and the longitudinal direction are formed in the vertical direction, and each tongue-shaped piece Z is constituted free [evacuation] so that passage of the measured object M may be permitted in each **, respectively.

[0024] That is, it has the frame part material 33 which consists of hard material, and this protection-from-light member 30 is supported by the susceptor 34 by which the both-sides section of the conveyance conveyor 4 was equipped with this frame part material 33 as shown in drawing 1, and has the composition of being prepared in a measurement part in the state of location immobilization. As

shown in drawing 7 - drawing 9 , and this frame part material 33 In the side-attachment-wall sections 30a and 30b which are formed in an abbreviation portal so that the measured object M can pass the lower part side, and are located in the conveyance right-and-left both-sides section by the directional vision which goes in the conveyance direction of the measured object M Opening 35a for optical passage which permits passage of the light on which it is projected by the measured object M from the floodlighting section 1, and opening 35b for optical passage which permits that the light which penetrated the measured object M passes towards a light sensing portion are formed, respectively, and is constituted.

[0025] In the side face by the side of conveyance direction superior [in this frame part material 33], and the side-face list by the side of the conveyance direction lower part, and to each of an upper part side part It sets in the conveyance direction superior side part list at each of an upper part side part to the measured object M M, i.e., the measured object located in a measurement part, which entered into the way side among this frame part material 33 from the conveyance direction lower part side part and the optical projection location Q. It has the screens 31a, 31b, and 31c which intercept surroundings lump light, respectively. These screens 31a, 31b, and 31c consist of elasticity material of protection-from-light nature, for example, thicker cloth, thicker sponge material, etc. which have protection-from-light nature, and even if variation is in the magnitude of the measured object M which passes through a measurement part, they are constituted free [evacuation] so that it may deform by flexion meeting a front face so that conveyance of each ***** M may not be checked and passage may be permitted. and to the screens 31a and 31b located in the conveyance direction superior side part and each conveyance direction lower part side part In order [which the measured object M is smoothly conveyed and is passed] to carry out thing permission, openings K1 and K2 are formed, and in the opening edge in each opening K1 and K2 As two or more tongue-shaped pieces Z of each other were torn apart, the mutual clearance is formed in the vertical direction in few condition, and each tongue-shaped piece Z is constituted free [evacuation] so that it may deform by flexion meeting each ** at the outside surface of the measured object M, respectively and passage of the measured object M may be permitted. Thus, it is considering that surroundings lump light leaks to a light sensing portion 2 side as the configuration avoidable as much as possible, making a radii-like outside surface meet smoothly, even if it is the measured object M which has the configuration of an abbreviation globular form like a mandarin orange.

[0026] As shown in drawing 9 , the opening K1 formed in screen 31a located in the conveyance direction superior side When evacuation rocking is carried out, the tongue-shaped piece Z which is formed in oversized opening for a while, and is moreover formed in the opening edge rather than the lower limit of the dimension of the measured object M predicted is shorter set up so that it may not check being projected on the light on which it is projected from the floodlighting section 1 by the measured object M. Moreover, since there are few possibilities that screen 31b located in the conveyance direction lower part side may check transparency of light with conveyance migration of a measured object in this way, said opening K2 is opening of eye small **, and a tongue-shaped piece Z is formed for a long time, and it is considering as the configuration whose surroundings lump light can avoid leaking to a light sensing portion 2 side as much as possible.

[0027] In addition, this protection-from-light member 30 cannot respond to the measured object of all configurations, and the protection-from-light member from which the appearance configuration which corresponds for every form of that differs will be used to the measured object M of another form with which dimensions differ.

[0028] Said control section 3 is constituted using the microcomputer, and as shown in drawing 4 , it is constituted so that actuation of each part may be controlled. That is, it has composition which controls actuation of each part, such as modification accommodation of the supply voltage supplied to the halogen lamp 6 in said floodlighting section 1, the switching action of the shutter devices 9 and 13 of floodlighting section 1 and light sensing portion 2 each and actuation of the vertical regulatory mechanism 21, and a modification control action of the charge storage time in a spectroscope 14. And this control section 3 is constituted so that data processing which analyzes the internal quality of the measured object M may be performed based on the measurement result obtained with the spectroscope

14.

[0029] Next, the control action by the control section 3 is explained. In advance of the usual measurement to the measured object M, a control section 3 replaces the light from the floodlighting section 1 with the measured object M, and irradiates said reference filter 22. the spectrum which carried out the spectrum of the transmitted light from the reference filter 22 by the light sensing portion 2, received the light which carried out the spectrum, and was obtained -- spectrum data -- criteria -- a spectrum -- with the criteria data measurement mode for which it asks as spectrum data Spectrum data are obtained. the measured object M conveyed by conveyance conveyor 4 -- receiving -- the floodlighting section 1 to light -- irradiating -- measurement -- a spectrum -- this measurement -- a spectrum -- spectrum data and said criteria -- a spectrum -- the internal quality of the measured object M is analyzed based on spectrum data -- it is usually constituted free [a switch in data measurement mode].

[0030] If it explains in full detail, in said criteria data measurement mode, it is in the condition of stopping conveyance of the measured object M by the conveyance conveyor 4, and the vertical regulatory mechanism 21 will be operated and said frame 20 will be switched to said reference measurement condition. and the spectrum which switched said each shutter device to the open condition, replaced the light from the floodlighting section 1 with the measured object M, irradiated said reference filter 22, carried out the spectrum of the transmitted light from the reference filter 22 by the light sensing portion 2, received the light which carried out the spectrum, and was obtained -- spectrum data -- criteria -- a spectrum -- it measures as spectrum data.

[0031] And in said criteria data measurement mode, the detection value (dark current data) of the photo sensor 18 in the non-light condition that the light to a light sensing portion 2 was intercepted is also measured. That is, he switches the shutter device of said light sensing portion 2 to a closed state, and is trying to calculate the detection value in every unit pixel of the photo sensor 18 at that time as dark current data.

[0032] Next, the control action in data measurement mode is usually explained. The object M measured [this / in data measurement mode, operate the vertical regulatory mechanism 21, usually switch a frame 20 to a measurement condition, and according to the conveyance conveyor 4] is conveyed. and -- whenever each ***** M passes through the part for measurement -- each measurement -- a spectrum -- spectrum data are measured. this measurement -- a spectrum -- in case spectrum data are performed, a control section 3 The measured object M follows on the conveyance direction front end location passing through the part for measurement, and is aimed at the field by the side of the conveyance direction front end of a measured object. said spectrum for performing preliminary measurement processing in which irradiate light, carry out the spectrum of the transmitted light to a measured object, receive the light which carried out the spectrum, and light-receiving data are obtained, and analyzing internal quality for the field of the conveyance direction central site of a measured object after that -- this measurement processing which measures spectrum data is performed. In said preliminary measurement processing, the detection value within the setup time by the photo sensor 18 (reserve measured value) is calculated for the field by the side of the conveyance direction front end of the measured object M. And it is made to carry out modification adjustment of the charge storage time when performing this measurement processing based on the light-receiving data obtained by preliminary measurement processing, so that the charge accumulated dose of a photo sensor 18 may turn into a setting proper amount.

[0033] In addition, standard magnitude differs according to the difference in a form, two or more steps of standard criteria data about the charge storage time set up the mandarin orange as a measured object in this equipment based on experimental data etc. according to the difference in such a form beforehand, and it memorizes. namely, as shown in drawing 6 , the shorter charge storage time Tx1 as a thing corresponding to the standard permeability to the form of a minor diameter is set up, and as a thing corresponding to the standard permeability of the form to the form of the magnitude like inside The charge storage time Tx2 like inside is set up, and the longer charge storage time Tx3 is set up as a thing corresponding to the standard permeability of the form to the form of a major diameter. And in an actual measurement activity, the thing of them which corresponds either will be chosen and the operating

condition in a control section 3 will be set up with the command means which is not illustrated.

[0034] If explanation is added about the concrete processing in an actual activity, the conveyance direction tip location of each ***** M first conveyed in the part for measurement based on the bearer rate of the conveyance conveyor 4 detected by the rotary encoder 23 and the detection information by said passage sensor 24 and the conveyance direction mid gear of the measured object M will ask for the timing which begins to pass through the part for measurement beforehand. That is, since the output of a passage sensor will switch from an OFF state to an ON state if the measured object M begins to be detected by the passage sensor 24, and it switches from an ON state to an OFF state after the measured object M ends passage, the conveyance direction tip location of the measured object M can ask for the timing which passes through the part for measurement from the measurement information and information on the bearer rate of the conveyance conveyor 4.

[0035] And as shown in the timing chart of drawing 6, the conveyance direction front end location of the measured object M repeats twice the empty reading actuation between [whose] the setup times Ts carries out empty reading of the detection value of a photo sensor 18 from the timing T1 which passes through the part for measurement. Then, light income measurement processing as preliminary measurement processing in which the detection value (reserve measured value) of a photo sensor 18 is read over the setup time Tu is performed. the detection value by the light income measurement processing -- a spectrum -- it does not use as spectrum data but the charge storage time in this measurement performed after that is used based on the measurement result as an index for carrying out modification adjustment that a charge accumulated dose should be made a setting proper amount. In addition, after predetermined time passes, he is trying for performing empty reading actuation twice to measure light income, since the measurement error by surroundings lump light is large if the conveyance direction front end location of the measured object M measures light income immediately to the timing T1 which passes through the part for measurement while extracting the charge which the capacitor has already stored electricity.

[0036] And based on the detection value by said light income measurement processing, increase and decrease of said charge storage time (that from which it is chosen of Tx1, Tx2, and Tx3 either) of accommodation are carried out at the value which is needed in order to make a charge accumulated dose into a setting proper amount corresponding to the permeability of the measured object. Relation between this light income and the charge storage time may be beforehand map-ized with experimental data etc., and may be suitably calculated based on operation expression. and the charge storage time set up by doing in this way in this measurement processing -- measurement -- a spectrum -- spectrum data are measured.

[0037] By drawing 6, the conveyance direction mid gear of the measured object M makes timing which passes through the part for measurement a reference point (0), measurement timing is shown in the measured object M of the Onaka smallness various kinds, and T2 shows among drawing the timing to which the conveyance direction termination location of the measured object M passes through the part for measurement by it. Data transfer shows the time amount which transmits measurement data to a control section 3.

[0038] Next, it is constituted so that data processing which analyzes the internal quality of the measured object M using the spectral-analysis technique which is a well-known technique based on the various data obtained by doing in this way may be performed. that is, measurement -- a spectrum -- spectrum data and said criteria -- a spectrum -- while acquiring the quadratic differential value in the wavelength field of the absorbance spectrum for every wavelength by which the spectrum was carried out, and an absorbance spectrum based on spectrum data and dark current data, it is constituted so that analysis data processing which computes the amount of components corresponding to the sugar content contained in the measured object M by the quadratic differential value and the amount of components corresponding to acidity may be performed. an absorbance d -- criteria -- a spectrum -- spectrum data -- Rd and measurement -- a spectrum -- if spectrum data are set to Sd and dark current data are set to Da -- [0039]

[Equation 1]

$$d = \log\{(Rd - Da) / (Sd - Da)\}$$

[0040] Coming out and defining, a control section 3 computes the amount of components contained in the measured object M based on the multiple regression analysis by following several 2.

[0041]

[Equation 2]

$Y = K_0 + K_1 \cdot A(\lambda_1) + K_2 \cdot A(\lambda_2)$

[0042] However, Y ; The amounts K_0 , K_1 , and K_2 of components ; A coefficient $A(\lambda_1)$, $A(\lambda_2)$; quadratic differential value of the absorbance spectrum in the specific wavelength λ_1 , and

[0043] In addition, for every component which computes the amount of components, the specific amount formula of components, the specific multipliers K_0 , K_1 , and K_2 and wavelength λ_1 , and λ_2 grade are beforehand set up by the control section 3, are memorized, and have at it composition which computes the amount of components of each component using the specific amount formula of components for every component of this.

[0044] [Another operation gestalt] Another operation gestalt is listed hereafter.

[0045] (1) Although elasticity material which is equipped with two or more tongue-shaped pieces located in a line along the vertical direction as said screen in the protection-from-light member which constitutes a protection-from-light means, and has protection-from-light nature, such as thicker cloth and sponge material, constituted from the above-mentioned operation gestalt You may constitute using two or more hard material by which division formation was carried out and each was prepared for example, not only in elasticity material but in the vertical direction free [evacuation rocking] as a screen. Or it may constitute from cloth material of the one-sheet configuration smoothly deformed by flexion so that the peripheral face of the measured object M may be met, or may constitute from sponge material of an one-sheet configuration etc. Moreover, as a protection-from-light means, it may replace with the above-mentioned configuration and may constitute as follows. that is, the optical-path member 40 for projection which forms the optical path L1 for projection which projects light on the measured object M from the floodlighting section 1 as shown in drawing 10 and drawing 11 -- and While each of the optical-path formation member 41 for light-receiving which forms the optical path L2 for light-receiving for leading the light which penetrated the measured object M to a light sensing portion 2 is constituted by tubed The floodlighting side electric shielding member 42 in which the optical passage hole L3 with which the point by the side of the measured object M of the optical-path formation member 40 for projection is equipped, and which stands in a row in the optical path L1 for projection as a protection-from-light means 30 was formed, Prepare for the point by the side of the measured object M of the optical-path formation member 41 for light-receiving, have the light-receiving side electric shielding member 43 in which the optical passage hole L4 which stands in a row in the optical path L2 for light-receiving was formed, and it is constituted. The floodlighting side electric shielding member 42 and the light-receiving side electric shielding member 43 may be constituted so that it may be formed in the shape of [which projects in a measurement part side] a truncated cone and forcible rotation actuation may be carried out in the same direction by the circumference of the axis of abscissa centering on each optical passage holes L3 and L4.

[0046] If explanation is added, said floodlighting side electric shielding member 42 and the light-receiving side electric shielding member 43 consist of elasticity material, such as sponge material, so that it has the shape of a truncated cone which projects in a measurement part side, and it can evacuate by elastic deformation at least, respectively, even if the larger measured object M contacts and is pressed by the front face of a conic opposed face. And the power of an electric motor 44 is told through the transmission belts 45 and 46, respectively, and each above-mentioned covered members 42 and 43 have composition by which a rotation drive is carried out in the same direction in one. Therefore, bringing close to the measured object M as much as possible with the floodlighting side electric shielding member 42 and the light-receiving side electric shielding member 43, and making it there be little surroundings lump light While the measured object M conveyed by conveyance conveyor 4 is guided at crosswise central approach by the truncated-cone-like floodlighting side electric shielding member 42 and the light-receiving side electric shielding member 43 It becomes possible to make it move smoothly, without the measured object M having conveyance checked by rotation actuation in response to a

delivery operation.

[0047] (2) With the above-mentioned operation gestalt, although the filter by opal glass was used as a criteria object, the quality of the material is not limited that what is necessary is just what has a predetermined absorbance property besides diffusion plates, such as not only this but an obscured glass. Moreover, as a floodlighting means, various kinds of floodlighting means of **, such as not only the halogen lamp 6 but a mercury-vapor lamp, Ne discharge tube, etc., may be used, and you may make it a light-receiving means also use other detection means, such as not only an MOS mold line sensor but a CCD mold line sensor.

[0048] (3) the above-mentioned operation gestalt -- the transmitted light from the measured object M -- being based -- a spectrum -- although the spectrum was measured -- not only a configuration such but the reflected light from the measured object M -- being based -- a spectrum -- you may make it measure a spectrum

[0049] (4) With the above-mentioned operation gestalt, as internal quality of the measured object M, although a sugar content and acidity were illustrated, the other internal quality, such as information not only on this but a flavor, may be measured.

[Translation done.]

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TECHNICAL FIELD

[Field of the Invention] This invention relates to the spectral-analysis equipment used in order to analyze the internal quality of measured objects, such as garden stuff. In detail A floodlighting means to project light to said measured object which a conveyance means to convey a measured object via a measurement part is established, and is located in said measurement part, It is projected from a floodlighting means, and a light-receiving means to receive the light which penetrated said measured object distributes to the right-and-left both-sides part of said measurement part, and is arranged, and it is related with the spectral-analysis equipment constituted by having the data-processing section which asks for the internal quality information of a measured object based on the measurement result of said light-receiving means.

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PRIOR ART

[Description of the Prior Art] In the spectral-analysis equipment of the above-mentioned configuration in the former A floodlighting means to project light to the measured object which is conveyed with a conveyance means and located in a measurement part as shown in JP,7-229840,A For example, the light source of a halogen lamp etc., As the light generated from the light source was reflected in the concave surface reflective section of an ellipse form and it was made to condense so that it may converge in a measurement part, it was constituted so that a measured object might be irradiated and the transmitted light from the measured object could be measured with a light-receiving means. It is made to make the light generated from the light source so that it may not be detected accidentally [carry out / the surroundings / which turn around even to a light-receiving means side indirectly / lump light which the light on which such a configuration is projected from a floodlighting means diffuses, and it is reflected by turning even to a direct and light-receiving means side **** or other objects through the periphery section of a measured object, and are carried out / incidence to a light-receiving means and] condense.

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] However, in this kind of spectral-analysis equipment, only the very small quantity of light of the quantity of lights on which the permeability of light of the garden stuff which is a measured object etc. is very small, and it is projected from a floodlighting means will be received with a light-receiving means. Therefore, in order to receive the quantity of light which is needed in order to ask for the internal quality information of a measured object, it is necessary to enlarge floodlighting reinforcement by the floodlighting means. When floodlighting reinforcement of a floodlighting means was enlarged such, it was not that to which a possibility that a strong light on which it is projected from a floodlighting means in a configuration may turn even to a light-receiving means through the periphery section of a measured object can fully control a large next door and such a surroundings lump light conventionally [above-mentioned]. Consequently, since the light-receiving means received surroundings lump light which was described above, there is a possibility that that part and measurement precision may fall, and an improvement was desired at this point.

[0004] This invention is made paying attention to this point, and the purpose controls generating of the measurement error by surroundings lump light which was described above, and is in the point of offering the spectral-analysis equipment which becomes possible [measuring with a sufficient precision].

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MEANS

[Means for Solving the Problem] A floodlighting means to project light to said measured object which according to claim 1 a conveyance means to convey a measured object via a measurement part is established, and is located in said measurement part, A light-receiving means to receive the light which was projected from the floodlighting means and penetrated said measured object In the spectral-analysis equipment constituted by having the data-processing section which distributes to the right-and-left both-sides part of said measurement part, is arranged, and asks for the internal quality information of a measured object based on the measurement result of said light-receiving means It is characterized by equipping said measurement part with a protection-from-light means to intercept the surroundings lump light which is going to carry out incidence to said light-receiving means, without penetrating said measured object among the light projected from said floodlighting means, permitting that said measured object passes.

[0006] Therefore, since the surroundings lump light which is going to carry out incidence to a light-receiving means is intercepted effectively, without penetrating a measured object among the light projected from the floodlighting means by equipping a measurement part with a protection-from-light means, a possibility that it may be incorrect-detected by the light-receiving means becomes few things. And there are few possibilities of reducing working capacity, without the measured object by which this protection-from-light means is conveyed via a measurement part by the conveyance means having composition which intercepts surroundings lump light effectively while it permits passing through a measurement part, and checking conveyance by the conveyance means.

[0007] Consequently, generating of the measurement error by surroundings lump light which was described above is controlled in the disadvantageous condition of reducing working capacity of not being generated, and it was able to come to offer the spectral-analysis equipment which becomes possible [measuring with a sufficient precision].

[0008] According to claim 2, it sets to claim 1. Said conveyance means It is constituted so that installation conveyance of said measured object may be carried out. Said protection-from-light means Set in the conveyance direction superior side part list rather than the optical projection location by said floodlighting means of said measured object located in said measurement part, and it sets to each of an upper part side part rather than the conveyance direction lower part side part and said optical projection location. The screen which is equipped with the screen which intercepts said surroundings lump light, is constituted, and is located in each of the said conveyance direction superior side part, the conveyance direction lower part side part, and an upper part side part is characterized by being constituted free [evacuation] so that passage of said measured object may be permitted.

[0009] Namely, the measured object which installation conveyance of the protection-from-light means is carried out with a conveyance means, and is located in a measurement part is received. Rather than the optical projection location by the floodlighting means of the measured object, in the conveyance direction superior side part list The conveyance direction lower part side part, and it being projected on the light of big floodlighting reinforcement from a floodlighting means, and, even if the light which turns around the periphery section of a measured object occurs since it has the screen which an upper

part side part is alike, respectively, sets, and intercepts surroundings lump light and consists of optical projection locations. Rather than the conveyance direction superior side part, the conveyance direction lower part side part, and an optical projection location, since surroundings lump light is certainly intercepted in each of an upper part side part by said each screen, by it, a possibility of carrying out incidence to a light-receiving means accidentally becomes few things from an optical projection location.

[0010] And since it is constituted free [evacuation] so that passage of said measured object may be permitted, while the measured object conveyed via a measurement part by the conveyance means permits passing through a measurement part, said screen. From an optical projection location, rather than the conveyance direction superior side part, the conveyance direction lower part side part, and an optical projection location, said surroundings lump light can be intercepted in each of an upper part side part, and a suitable means to carry out claim 1 is acquired.

[0011] According to claim 3, in claim 2, the screen located in the said conveyance direction superior side part and each conveyance direction lower part side part. While having opening which permits passage of said measured object, two or more tongue-shaped pieces cut and lacked in the list and the longitudinal direction in the vertical direction are formed in the opening edge in each opening, and it is characterized by constituting each tongue-shaped piece free [evacuation], respectively so that passage of said measured object may be permitted in each **.

[0012] namely, said each screen is equipped with opening which permits passage of a measured object, and in the opening edge in each opening. Since two or more tongue-shaped pieces are formed in the vertical direction, and each tongue-shaped piece is constituted free [evacuation], respectively so that passage of said measured object may be permitted in each ** and it permits passage to the measured object which passes through a measurement part while said each tongue-shaped piece evacuates to each **. For example, making the curved appearance configuration meet and maintaining an optical cut off state, even if an appearance is a measured globular form or almost globular form object like garden stuff, it becomes what can permit passage and a suitable means to carry out claim 2 is acquired.

[0013] The optical-path member for projection which forms the optical path for projection which projects light on a measured object from said floodlighting means according to claim 4, While each of the optical-path formation member for light-receiving which forms the optical path for light-receiving for leading the light which penetrated the measured object to said light-receiving means is constituted by tubed, and said protection-from-light means. The floodlighting side electric shielding member in which the optical passage hole with which the point by the side of the measured object of said optical-path formation member for projection is equipped, and which stands in a row in said optical path for projection was formed, Prepare for the point by the side of the measured object of said optical-path formation member for light-receiving, have the light-receiving side electric shielding member in which the optical passage hole which stands in a row in said optical path for light-receiving was formed, and it is constituted. Said floodlighting side electric shielding member and a light-receiving side electric shielding member are characterized by being constituted so that it may be formed in the shape of [which projects in said measurement part side] a truncated cone and forcible rotation actuation may be carried out in the same direction by the circumference of the axis of abscissa centering on said each optical passage hole.

[0014] That is, the light on which it is projected from a floodlighting means lets the optical path for projection of the optical-path member for projection, and the optical passage hole formed in the floodlighting side electric shielding member pass, and is irradiated by the measured object. And the light which penetrated the measured object is led to a light-receiving means through the optical passage hole formed in the light-receiving side electric shielding member, and the optical path for light-receiving of the optical-path formation member for light-receiving. And a floodlighting side electric shielding member and a light-receiving side electric shielding member are formed in the shape of [which projects in a measurement part side] a truncated cone. Since it is constituted so that forcible rotation actuation may be carried out in the same direction by the circumference of the axis of abscissa centering on each optical passage hole, and the measured object which was conveyed with the conveyance means and

arrived at the measurement part It can change into the condition of projecting light where the side face by the side of the measurement part of the floodlighting side electric shielding member formed in the shape of a truncated cone and a light-receiving side electric shielding member showed around and said each optical passage hole is approached. And said each covered member becomes possible [carrying out passage migration smoothly], without checking conveyance, even if it is the case where a measured object contacts each covered member since forcible rotation is carried out in the same direction.

[0015] Therefore, without working capacity making it fall, without checking the conveyance migration by the conveyance means, as a measured object is passed in the condition of bringing close, as much as possible between a floodlighting side electric shielding member and a light-receiving side electric shielding member, it becomes possible to intercept said surroundings lump light, and a suitable means to carry out claim 1 is acquired.

[0016]

[Embodiment of the Invention] Hereafter, about the spectral-analysis equipment concerning this invention, it prepares for the fruit-sorting facility which performs sorting classification of a mandarin orange as a measured object, and the case where it applies to the configuration which measures the internal quality information of a mandarin orange, i.e., a sugar content, acidity, etc., is explained based on a drawing.

[0017] The floodlighting section 1 as a floodlighting means by which this spectral-analysis equipment irradiates light at the measured object M (mandarin orange) as shown in drawing 1 , the light which penetrated the measured object M -- a spectrum -- carrying out -- the light which carried out the spectrum -- receiving light -- a spectrum, while controlling actuation of the light sensing portion 2 as a light-receiving means to obtain spectrum data, and each part It has the control-section 3 grade which functions as the data-processing section which asks for the internal quality information of a measured object based on the measurement result of a light sensing portion 2, and is constituted. The measured object M (mandarin orange) It has become column-like by the single tier by conveyance conveyor 4 with the configuration by which installation conveyance is carried out, and it is constituted so that it may pass through the measurement part by this spectral-analysis equipment one by one. And after the light projected from the floodlighting section 1 penetrates the measured object M to the measured object M located in a measurement part, in the condition that light is received by the light sensing portion 2, the floodlighting section 1 and a light sensing portion 2 distribute to the right-and-left both-sides part of a measurement part, and are arranged.

[0018] The reflecting mirror 8 sideways changed towards the measured object M which said floodlighting section 1 reflects the reflected light by that reflecting plate 7 while having the halogen lamp 6 as an emitter which emits light with the power supplied from a power circuit 5, and the reflecting plate 7 of the concave surface configuration reflected towards a lower part side so that the light which emits light from this halogen lamp 6 may be made to condense, and is located in a measurement part is formed. Furthermore, the shutter device 9 which can be freely switched to the condition that the light reflected with the reflecting mirror 8 is irradiated by the measurement part, and the condition of intercepting light is established.

[0019] In said light sensing portion 2 The condenser lens 10 which condenses the light which penetrated the measured object M, the reflecting mirror 11 which reflects light upward, the color filter 12 which passes only the light of a wavelength field for measurement which is mentioned later, and the shutter device 13 which can be freely switched to the open condition of passing light, and the closed state which intercepts light, if incidence of the light which passed the shutter device 13 of an open condition is carried out -- the light -- a spectrum -- carrying out -- said spectrum -- it has the spectroscopy 14 grade which measures spectrum data, and is constituted. The reflecting mirror 16 which reflects the light which carried out incidence from ON **** 15 as said spectroscopy 14 is shown in drawing 2 , the spectrum which carries out the spectrum of the reflected light to the light of two or more wavelength -- with the concave grating 17 as a means detecting the optical reinforcement for every wavelength in which the spectrum was carried out by the concave grating 17 -- a spectrum -- the photo sensor 18 which measures spectrum data has composition arranged in the black box 19 which consists of a protection-

from-light nature ingredient which shades the light from the outside. Said photo sensor 18 consists of 1024-bit MOS mold line sensors which change and output the transmitted light by which the part light reflex was carried out by the concave grating 17 to the signal for every wavelength while receiving light for every wavelength to coincidence. Although a detailed explanation is not carried out, this line sensor carries out the interior of the drive circuit for making the capacitor which accumulates the charge obtained in optoelectric transducers, such as a photodiode, and the optoelectric transducer of those for every unit pixel, and its stored charge output outside etc., and is constituted. In addition, the charge storage time by the capacitor can be made to change through a drive circuit from the exterior now. And the light of the wavelength of the range of 700nm - 1100nm can be detected now.

[0020] Said floodlighting section 1 and light sensing portion 2 can be prepared in the condition of being supported in one with the frame 20 prepared so that the upper part side of the measurement part through which the measured object M passes might be bypassed, and, as for this frame 20, that whole can carry out now modification accommodation of the location of the vertical direction to the conveyance conveyor 4 by the vertical regulatory mechanism 21. Although a detailed explanation is not carried out about the vertical regulatory mechanism 21, it can be made to move up and down by screw delivery device 21b which it is installed in the state of location immobilization to a fixed part F, and is driven in electric motor 21a. And you make it located in the upper part side of the passage part of the measured object M in said conveyance conveyor 4, and the reference filter 22 which is an example of a criteria object is formed in the condition that location immobilization is carried out, by said fixed part F. This reference filter 22 consists of light filters which have a predetermined absorbance property, and, specifically, is constituted using opal glass.

[0021] And by carrying out centering control of said whole frame 20 in the vertical direction As it is indicated in drawing 3 (b) as the usual measurement condition received by the light sensing portion 2 after the light from the floodlighting section 1 penetrates the measured object M laid in the conveyance conveyor 4, as shown in drawing 3 (b) After the light from each floodlighting section 1 penetrates said reference filter 22, it is constituted so that it can switch to the reference measurement condition received by the light sensing portion 2.

[0022] Said conveyance conveyor 4 has the composition of driving endless rotation band 4a by electric motor 4b. It has the rotary encoder 23 which detects the rotation condition of the revolving shaft of body-of-revolution 4c which winds the endless rotation band 4a. The detection information on this rotary encoder 23 also has the composition of being inputted into a control section 3, and further, as shown in drawing 5, the conveyance direction superior side part of said measurement part by the conveyance conveyor 4 is equipped with the optical passage sensor 24 which detects passage of the measured object M. Photogenic organ 24a which emits light, and electric-eye 24b which receives that light this passage sensor 24 it distributes to the right-and-left both-sides section of the conveyance path by the conveyance conveyor 4, and is arranged, if the light which the measured object M did not exist but emitted light from photogenic organ 24a is received in electric-eye 24b, it will be in an OFF state, and light is interrupted by the measured object M, and light receives light in electric-eye 24b -- it has -- it can kick and will be in an ON state.

[0023] And in this spectral-analysis equipment, it has the protection-from-light member 30 as a protection-from-light means to intercept the surroundings lump light which is going to carry out incidence to a light sensing portion 2, without penetrating the measured object M among the light projected from the floodlighting section 1, permitting that said measured object M passes in said measurement part. If it explains in full detail, will set this protection-from-light member 30 in the conveyance direction superior side part list from the optical projection location Q by the floodlighting section 1 of the measured object M located in a measurement part, and it will be set to each of an upper part side part from the conveyance direction lower part side part and the optical projection location Q. Have the screens 31a, 31b, and 31c which intercept surroundings lump light, and it is constituted. The screens 31a, 31b, and 31c located in each of the conveyance direction superior side part, the conveyance direction lower part side part, and an upper part side part It is constituted free [evacuation] so that passage of the measured object M may be permitted. Further The screens 31a and 31b located in the

conveyance direction superior side part and each conveyance direction lower part side part While the openings K1 and K2 which permit passage of the measured object M are formed, in the opening edge in each opening K1 and K2 Two or more tongue-shaped pieces Z cut and lacked in the list and the longitudinal direction are formed in the vertical direction, and each tongue-shaped piece Z is constituted free [evacuation] so that passage of the measured object M may be permitted in each **, respectively. [0024] That is, it has the frame part material 33 which consists of hard material, and this protection-from-light member 30 is supported by the susceptor 34 by which the both-sides section of the conveyance conveyor 4 was equipped with this frame part material 33 as shown in drawing 1 , and has the composition of being prepared in a measurement part in the state of location immobilization. As shown in drawing 7 - drawing 9 , and this frame part material 33 In the side-attachment-wall sections 30a and 30b which are formed in an abbreviation portal so that the measured object M can pass the lower part side, and are located in the conveyance right-and-left both-sides section by the directional vision which goes in the conveyance direction of the measured object M Opening 35a for optical passage which permits passage of the light on which it is projected by the measured object M from the floodlighting section 1, and opening 35b for optical passage which permits that the light which penetrated the measured object M passes towards a light sensing portion are formed, respectively, and is constituted.

[0025] In the side face by the side of conveyance direction superior [in this frame part material 33], and the side-face list by the side of the conveyance direction lower part, and to each of an upper part side part It sets in the conveyance direction superior side part list at each of an upper part side part to the measured object M M, i.e., the measured object located in a measurement part, which entered into the way side among this frame part material 33 from the conveyance direction lower part side part and the optical projection location Q. It has the screens 31a, 31b, and 31c which intercept surroundings lump light, respectively. These screens 31a, 31b, and 31c consist of elasticity material of protection-from-light nature, for example, thicker cloth, thicker sponge material, etc. which have protection-from-light nature, and even if variation is in the magnitude of the measured object M which passes through a measurement part, they are constituted free [evacuation] so that it may deform by flexion meeting a front face so that conveyance of each ***** M may not be checked and passage may be permitted. and to the screens 31a and 31b located in the conveyance direction superior side part and each conveyance direction lower part side part In order [which the measured object M is smoothly conveyed and is passed] to carry out thing permission, openings K1 and K2 are formed, and in the opening edge in each opening K1 and K2 As two or more tongue-shaped pieces Z of each other were torn apart, the mutual clearance is formed in the vertical direction in few condition, and each tongue-shaped piece Z is constituted free [evacuation] so that it may deform by flexion meeting each ** at the outside surface of the measured object M, respectively and passage of the measured object M may be permitted. Thus, it is considering that surroundings lump light leaks to a light sensing portion 2 side as the configuration avoidable as much as possible, making a radii-like outside surface meet smoothly, even if it is the measured object M which has the configuration of an abbreviation globular form like a mandarin orange.

[0026] As shown in drawing 9 , the opening K1 formed in screen 31a located in the conveyance direction superior side When evacuation rocking is carried out, the tongue-shaped piece Z which is formed in oversized opening for a while, and is moreover formed in the opening edge rather than the lower limit of the dimension of the measured object M predicted is shorter set up so that it may not check being projected on the light on which it is projected from the floodlighting section 1 by the measured object M. Moreover, since there are few possibilities that screen 31b located in the conveyance direction lower part side may check transparency of light with conveyance migration of a measured object in this way, said opening K2 is opening of eye small **, and a tongue-shaped piece Z is formed for a long time, and it is considering as the configuration whose surroundings lump light can avoid leaking to a light sensing portion 2 side as much as possible.

[0027] In addition, this protection-from-light member 30 cannot respond to the measured object of all configurations, and the protection-from-light member from which the appearance configuration which corresponds for every form of that differs will be used to the measured object M of another form with

which dimensions differ.

[0028] Said control section 3 is constituted using the microcomputer, and as shown in drawing 4, it is constituted so that actuation of each part may be controlled. That is, it has composition which controls actuation of each part, such as modification accommodation of the supply voltage supplied to the halogen lamp 6 in said floodlighting section 1, the switching action of the shutter devices 9 and 13 of floodlighting section 1 and light sensing portion 2 each and actuation of the vertical regulatory mechanism 21, and a modification control action of the charge storage time in a spectroscope 14. And this control section 3 is constituted so that data processing which analyzes the internal quality of the measured object M may be performed based on the measurement result obtained with the spectroscope 14.

[0029] Next, the control action by the control section 3 is explained. In advance of the usual measurement to the measured object M, a control section 3 replaces the light from the floodlighting section 1 with the measured object M, and irradiates said reference filter 22. the spectrum which carried out the spectrum of the transmitted light from the reference filter 22 by the light sensing portion 2, received the light which carried out the spectrum, and was obtained -- spectrum data -- criteria -- a spectrum -- with the criteria data measurement mode for which it asks as spectrum data Spectrum data are obtained. the measured object M conveyed by conveyance conveyor 4 -- receiving -- the floodlighting section 1 to light -- irradiating -- measurement -- a spectrum -- this measurement -- a spectrum -- spectrum data and said criteria -- a spectrum -- the internal quality of the measured object M is analyzed based on spectrum data -- it is usually constituted free [a switch in data measurement mode].

[0030] If it explains in full detail, in said criteria data measurement mode, it is in the condition of stopping conveyance of the measured object M by the conveyance conveyor 4, and the vertical regulatory mechanism 21 will be operated and said frame 20 will be switched to said reference measurement condition. and the spectrum which switched said each shutter device to the open condition, replaced the light from the floodlighting section 1 with the measured object M, irradiated said reference filter 22, carried out the spectrum of the transmitted light from the reference filter 22 by the light sensing portion 2, received the light which carried out the spectrum, and was obtained -- spectrum data -- criteria -- a spectrum -- it measures as spectrum data.

[0031] And in said criteria data measurement mode, the detection value (dark current data) of the photo sensor 18 in the non-light condition that the light to a light sensing portion 2 was intercepted is also measured. That is, he switches the shutter device of said light sensing portion 2 to a closed state, and is trying to calculate the detection value in every unit pixel of the photo sensor 18 at that time as dark current data.

[0032] Next, the control action in data measurement mode is usually explained. The object M measured [this / in data measurement mode, operate the vertical regulatory mechanism 21, usually switch a frame 20 to a measurement condition, and according to the conveyance conveyor 4] is conveyed. and -- whenever each ***** M passes through the part for measurement -- each measurement -- a spectrum -- spectrum data are measured. this measurement -- a spectrum -- in case spectrum data are performed, a control section 3 The measured object M follows on the conveyance direction front end location passing through the part for measurement, and is aimed at the field by the side of the conveyance direction front end of a measured object. said spectrum for performing preliminary measurement processing in which irradiate light, carry out the spectrum of the transmitted light to a measured object, receive the light which carried out the spectrum, and light-receiving data are obtained, and analyzing internal quality for the field of the conveyance direction central site of a measured object after that -- this measurement processing which measures spectrum data is performed. In said preliminary measurement processing, the detection value within the setup time by the photo sensor 18 (reserve measured value) is calculated for the field by the side of the conveyance direction front end of the measured object M. And it is made to carry out modification adjustment of the charge storage time when performing this measurement processing based on the light-receiving data obtained by preliminary measurement processing, so that the charge accumulated dose of a photo sensor 18 may turn into a setting proper amount.

[0033] In addition, standard magnitude differs according to the difference in a form, two or more steps of standard criteria data about the charge storage time set up the mandarin orange as a measured object in this equipment based on experimental data etc. according to the difference in such a form beforehand, and it memorizes. namely, as shown in drawing 6, the shorter charge storage time Tx1 as a thing corresponding to the standard permeability to the form of a minor diameter is set up, and as a thing corresponding to the standard permeability of the form to the form of the magnitude like inside The charge storage time Tx2 like inside is set up, and the longer charge storage time Tx3 is set up as a thing corresponding to the standard permeability of the form to the form of a major diameter. And in an actual measurement activity, the thing of them which corresponds either will be chosen and the operating condition in a control section 3 will be set up with the command means which is not illustrated.

[0034] If explanation is added about the concrete processing in an actual activity, the conveyance direction tip location of each ***** M first conveyed in the part for measurement based on the bearer rate of the conveyance conveyor 4 detected by the rotary encoder 23 and the detection information by said passage sensor 24 and the conveyance direction mid gear of the measured object M will ask for the timing which begins to pass through the part for measurement beforehand. That is, since the output of a passage sensor will switch from an OFF state to an ON state if the measured object M begins to be detected by the passage sensor 24, and it switches from an ON state to an OFF state after the measured object M ends passage, the conveyance direction tip location of the measured object M can ask for the timing which passes through the part for measurement from the measurement information and information on the bearer rate of the conveyance conveyor 4.

[0035] And as shown in the timing chart of drawing 6, the conveyance direction front end location of the measured object M repeats twice the empty reading actuation between [whose] the setup times Ts carries out empty reading of the detection value of a photo sensor 18 from the timing T1 which passes through the part for measurement. Then, light income measurement processing as preliminary measurement processing in which the detection value (reserve measured value) of a photo sensor 18 is read over the setup time Tu is performed. the detection value by the light income measurement processing -- a spectrum -- it does not use as spectrum data but the charge storage time in this measurement performed after that is used based on the measurement result as an index for carrying out modification adjustment that a charge accumulated dose should be made a setting proper amount. In addition, after predetermined time passes, he is trying for performing empty reading actuation twice to measure light income, since the measurement error by surroundings lump light is large if the conveyance direction front end location of the measured object M measures light income immediately to the timing T1 which passes through the part for measurement while extracting the charge which the capacitor has already stored electricity.

[0036] And based on the detection value by said light income measurement processing, increase and decrease of said charge storage time (that from which it is chosen of Tx1, Tx2, and Tx3 either) of accommodation are carried out at the value which is needed in order to make a charge accumulated dose into a setting proper amount corresponding to the permeability of the measured object. Relation between this light income and the charge storage time may be beforehand map-ized with experimental data etc., and may be suitably calculated based on operation expression. and the charge storage time set up by doing in this way in this measurement processing -- measurement -- a spectrum -- spectrum data are measured.

[0037] By drawing 6, the conveyance direction mid gear of the measured object M makes timing which passes through the part for measurement a reference point (0), measurement timing is shown in the measured object M of the Onaka smallness various kinds, and T2 shows among drawing the timing to which the conveyance direction termination location of the measured object M passes through the part for measurement by it. Data transfer shows the time amount which transmits measurement data to a control section 3.

[0038] Next, it is constituted so that data processing which analyzes the internal quality of the measured object M using the spectral-analysis technique which is a well-known technique based on the various data obtained by doing in this way may be performed. that is, measurement -- a spectrum -- spectrum

data and said criteria -- a spectrum -- while acquiring the quadratic differential value in the wavelength field of the absorbance spectrum for every wavelength by which the spectrum was carried out, and an absorbance spectrum based on spectrum data and dark current data, it is constituted so that analysis data processing which computes the amount of components corresponding to the sugar content contained in the measured object M by the quadratic differential value and the amount of components corresponding to acidity may be performed. an absorbance d -- criteria -- a spectrum -- spectrum data -- Rd and measurement -- a spectrum -- if spectrum data are set to Sd and dark current data are set to Da -- [0039]

[Equation 1]

$$d = \log\{(Rd - Da) / (Sd - Da)\}$$

[0040] Coming out and defining, a control section 3 computes the amount of components contained in the measured object M based on the multiple regression analysis by following several 2.

[0041]

[Equation 2]

$$Y = K0 + K1 \cdot A(\lambda 1) + K2 \cdot A(\lambda 2)$$

[0042] However, Y ; The amounts K0, K1, and K2 of components ; A coefficient A (lambda 1), A (lambda 2) ; quadratic differential value of the absorbance spectrum in the specific wavelength lambda

[0043] In addition, for every component which computes the amount of components, the specific amount formula of components, the specific multipliers K0, K1, and K2 and wavelength lambda 1, and lambda 2 grade are beforehand set up by the control section 3, are memorized, and have at it composition which computes the amount of components of each component using the specific amount formula of components for every component of this.

[0044] [Another operation gestalt] Another operation gestalt is listed hereafter.

[0045] (1) Although elasticity material which is equipped with two or more tongue-shaped pieces located in a line along the vertical direction as said screen in the protection-from-light member which constitutes a protection-from-light means, and has protection-from-light nature, such as thicker cloth and sponge material, constituted from the above-mentioned operation gestalt You may constitute using two or more hard material by which division formation was carried out and each was prepared for example, not only in elasticity material but in the vertical direction free [evacuation rocking] as a screen. Or it may constitute from cloth material of the one-sheet configuration smoothly deformed by flexion so that the peripheral face of the measured object M may be met, or may constitute from sponge material of an one-sheet configuration etc. Moreover, as a protection-from-light means, it may replace with the above-mentioned configuration and may constitute as follows. that is, the optical-path member 40 for projection which forms the optical path L1 for projection which projects light on the measured object M from the floodlighting section 1 as shown in drawing 10 and drawing 11 -- and While each of the optical-path formation member 41 for light-receiving which forms the optical path L2 for light-receiving for leading the light which penetrated the measured object M to a light sensing portion 2 is constituted by tubed The floodlighting side electric shielding member 42 in which the optical passage hole L3 with which the point by the side of the measured object M of the optical-path formation member 40 for projection is equipped, and which stands in a row in the optical path L1 for projection as a protection-from-light means 30 was formed, Prepare for the point by the side of the measured object M of the optical-path formation member 41 for light-receiving, have the light-receiving side electric shielding member 43 in which the optical passage hole L4 which stands in a row in the optical path L2 for light-receiving was formed, and it is constituted. The floodlighting side electric shielding member 42 and the light-receiving side electric shielding member 43 may be constituted so that it may be formed in the shape of [which projects in a measurement part side] a truncated cone and forcible rotation actuation may be carried out in the same direction by the circumference of the axis of abscissa centering on each optical passage holes L3 and L4.

[0046] If explanation is added, said floodlighting side electric shielding member 42 and the light-receiving side electric shielding member 43 consist of elasticity material, such as sponge material, so that it has the shape of a truncated cone which projects in a measurement part side, and it can evacuate by elastic deformation at least, respectively, even if the larger measured object M contacts and is pressed

by the front face of a conic opposed face. And the power of an electric motor 44 is told through the transmission belts 45 and 46, respectively, and each above-mentioned covered members 42 and 43 have composition by which a rotation drive is carried out in the same direction in one. Therefore, bringing close to the measured object M as much as possible with the floodlighting side electric shielding member 42 and the light-receiving side electric shielding member 43, and making it there be little surroundings lump light While the measured object M conveyed by conveyance conveyor 4 is guided at crosswise central approach by the truncated-cone-like floodlighting side electric shielding member 42 and the light-receiving side electric shielding member 43 It becomes possible to make it move smoothly, without the measured object M having conveyance checked by rotation actuation in response to a delivery operation.

[0047] (2). With the above-mentioned operation gestalt, although the filter by opal glass was used as a criteria object, the quality of the material is not limited that what is necessary is just what has a predetermined absorbance property besides diffusion plates, such as not only this but an obscured glass. Moreover, as a floodlighting means, various kinds of floodlighting means of **, such as not only the halogen lamp 6 but a mercury-vapor lamp, Ne discharge tube, etc., may be used, and you may make it a light-receiving means also use other detection means, such as not only an MOS mold line sensor but a CCD mold line sensor.

[0048] (3) the above-mentioned operation gestalt -- the transmitted light from the measured object M -- being based -- a spectrum -- although the spectrum was measured -- not only a configuration such but the reflected light from the measured object M -- being based -- a spectrum -- you may make it measure a spectrum

[0049] (4) With the above-mentioned operation gestalt, as internal quality of the measured object M, although a sugar content and acidity were illustrated, the other internal quality, such as information not only on this but a flavor, may be measured.

[Translation done.]

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1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. **** shows the word which can not be translated.
3. In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] The outline block diagram of spectral-analysis equipment

[Drawing 2] The block diagram of a spectroscope

[Drawing 3] Drawing showing a vertical repositioning condition

[Drawing 4] Control-block Fig.

[Drawing 5] The top view showing the installation condition of spectral-analysis equipment

[Drawing 6] The timing chart of measurement actuation

[Drawing 7] The perspective view showing a protection-from-light member

[Drawing 8] The crossing top view of a protection-from-light member

[Drawing 9] The front view and vertical section front view showing a protection-from-light member

[Drawing 10] The top view of the protection-from-light means of another operation gestalt

[Drawing 11] The side elevation of the protection-from-light means of another operation gestalt

[Description of Notations]

1 Floodlighting Means

2 Light-receiving Means

3 Data-Processing Section

4 Conveyance Means

30 Protection-from-Light Means

31a, 31b, 31c Screen

40 Optical-Path Formation Member for Projection

41 Optical-Path Formation Member for Light-receiving

42 Floodlighting Side Electric Shielding Member

43 Light-receiving Side Electric Shielding Member

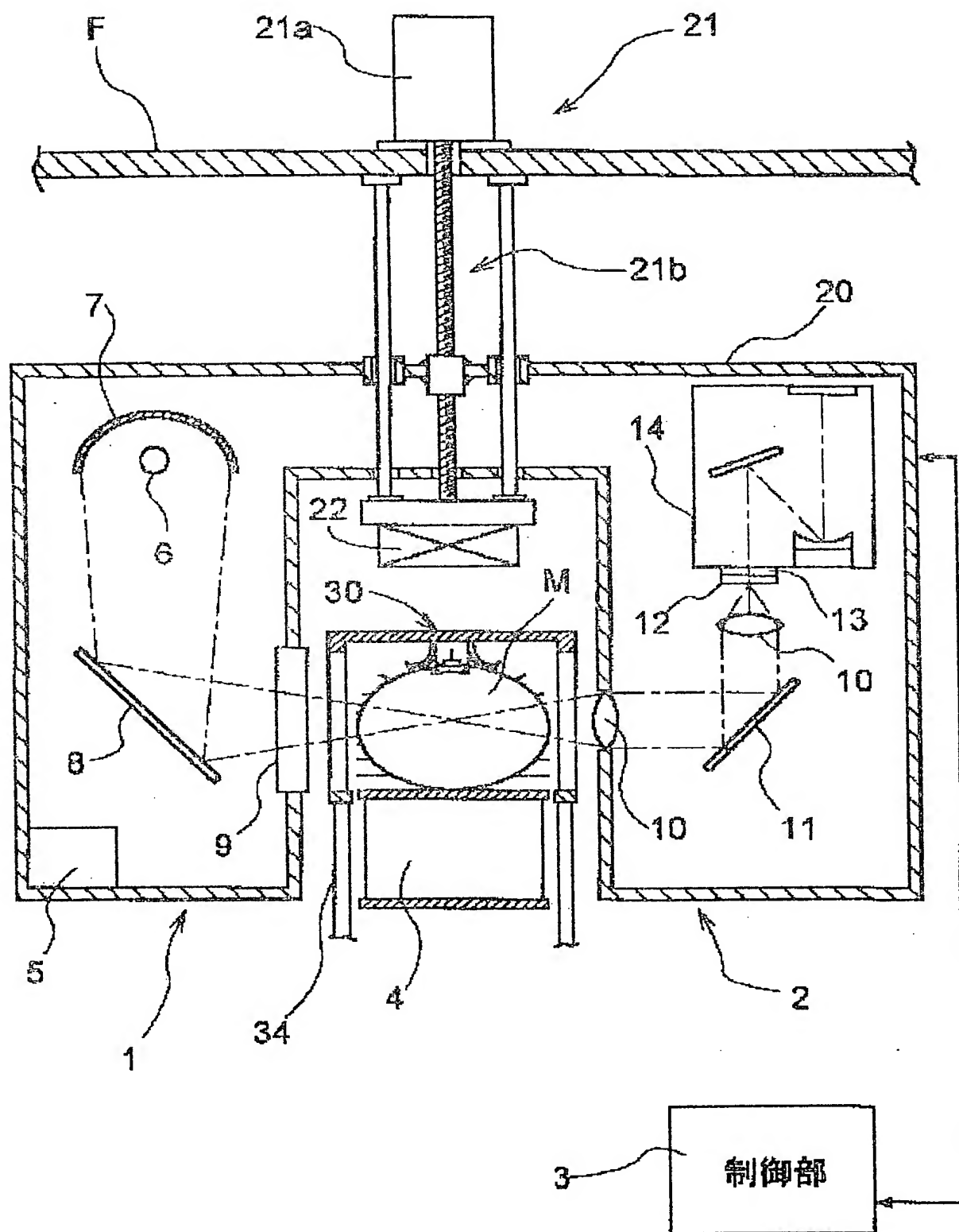
L1 Optical path for projection

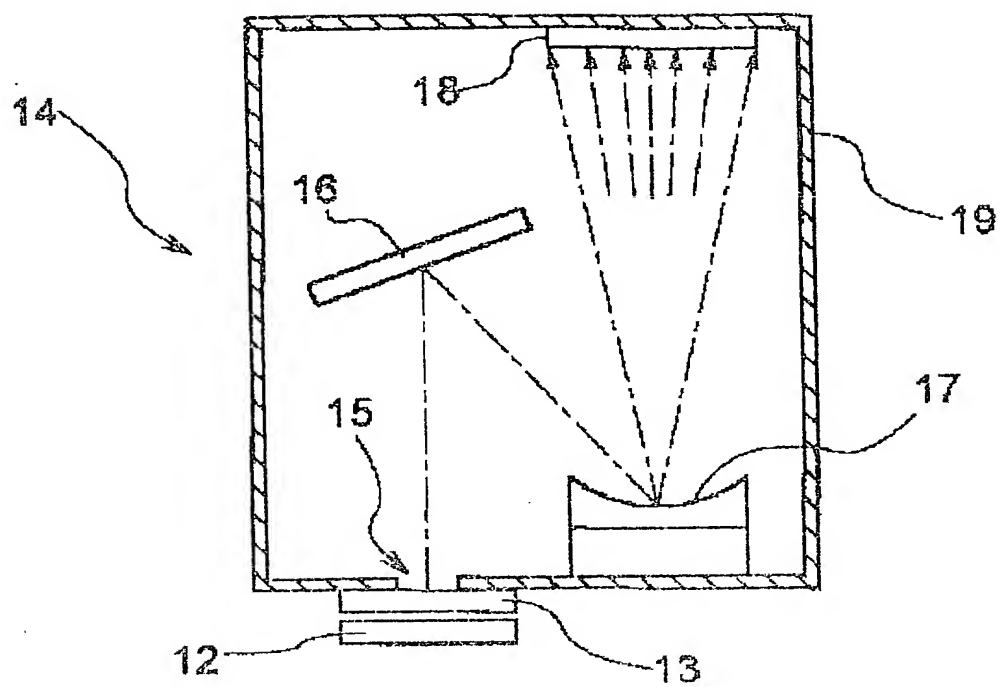
L2 Optical path for light-receiving

L3, L4 Light transmission hole

M A measured object

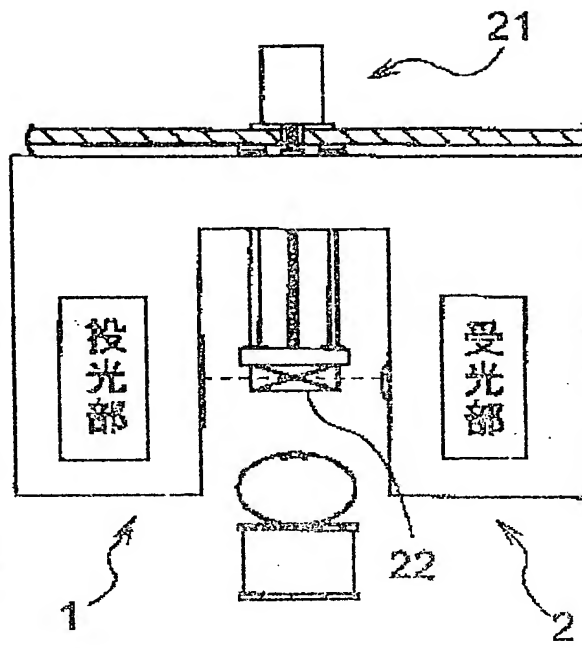
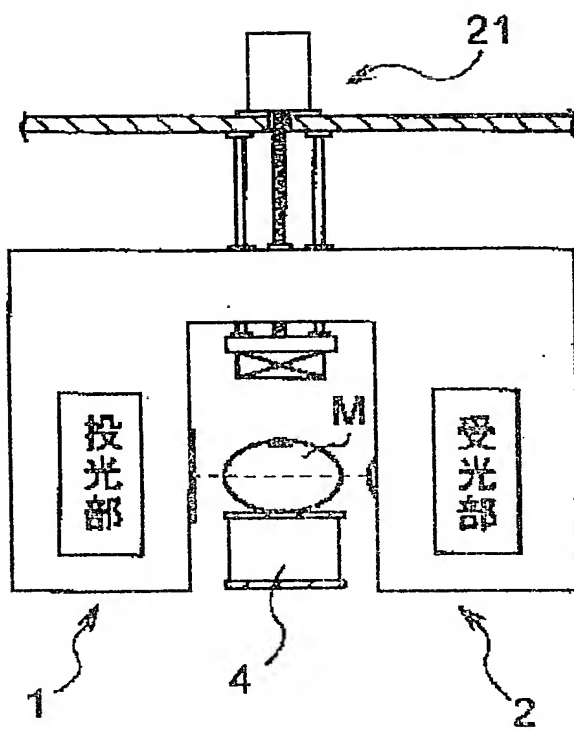
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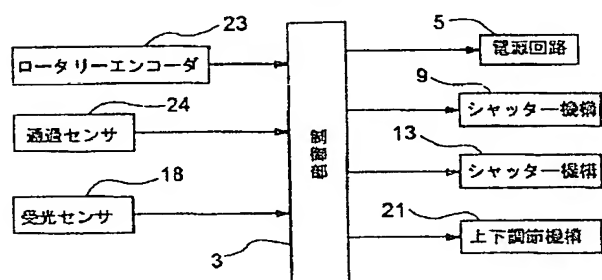


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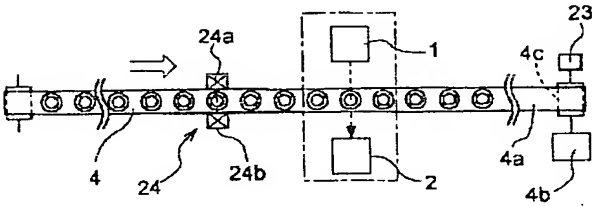


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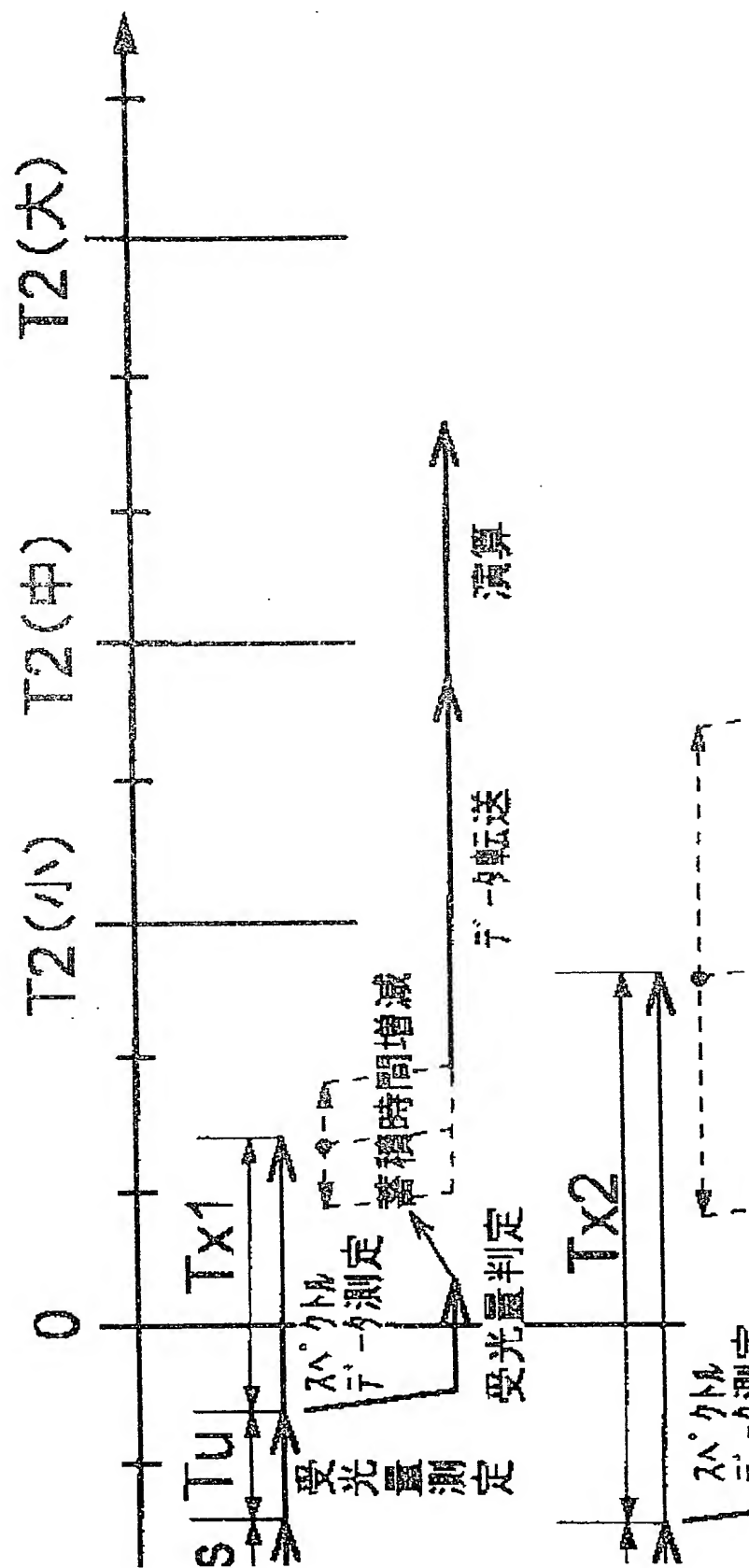
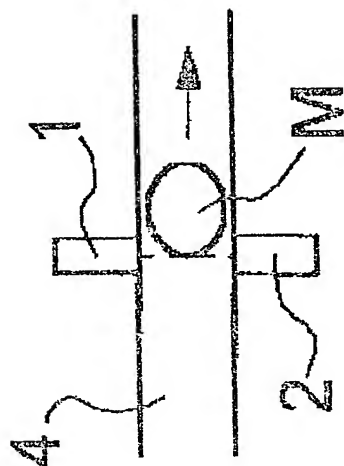
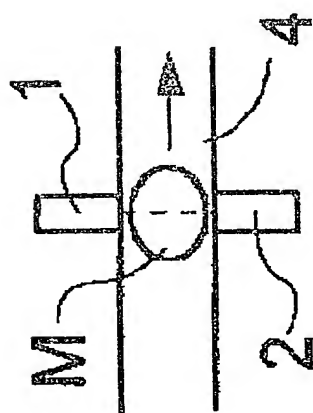


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Drawing selection drawing 5



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受光量判定

真經世圖

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